Indicating Restaurant Firms' Financial Constraints: A New Composite Index

Purpose – The main objectives of this study were: 1) to develop an index for financial constraints specifically for restaurant firms and 2) to validate the developed financial constraint index.

Design/methodology/approach – This study used logistic regression with a composite criterion based on the dividend payout ratio, KZ index, and Cleary index to estimate restaurant firms' financial constraints. Then, a fixed-effects regression was used to verify the validity of the measurement of restaurant firms' financial constraints.

Findings – A restaurant firm's operating profit, financial leverage, asset tangibility, sale of fixed assets, and percentage change in number of employees are critical indicators for identifying financial constraints. The results indicated that in cases with positive operating cash flows, the effect of operating cash flow on capital investments continuously decreased as restaurant firms' financial constraints increased.

Originality/value – This study is unique in that the specific financial and operational characteristics of restaurant firms were included in the model to determine financial constraint indicators, such as sale of fixed assets and percentage change in number of employees.

Keywords: *restaurant financial constraint, KZ index, Cleary index, investment-cash flow sensitivity*

1. Introduction

The restaurant industry has outpaced average U.S. job growth and continues to be among the economy's leaders in job creation (NRA, 2017). According to the National Restaurant Association (NRA), the number of restaurant employees has reached 14.4 million, representing

10% of all American workers. In addition, restaurant industry sales reached $782.7 billion in 2016, which is approximately 4% of the U.S. gross domestic product (NRA, 2017).

Despite the industry's continuous growth, restaurant managers are not free from business obstacles, such as financial difficulties (Beck et al., 2005), policy instability (Almeida and Carneiro, 2009), severe market competition (Djankov et al., 2002), and lack of resources, knowledge, or competence (Davidsson, 1991). These issues have substantial effects on the survival and success of a business. Not surprisingly, the level of financial constraint directly affects a firm's overall business practices, such as investment, liquidity management, marketing, and product development. Indeed, during the 2008 financial crisis, financially constrained U.S. firms drastically reduced employment (by 11%), technology spending (by 22%), capital investments (by 9%), marketing expenditures (by 33%), and dividend payments (by 14%) by significantly larger amounts compared with financially unconstrained firms (Campello, Graham, and Harvey, 2010).

In addition, difficulties in accessing external financing force financially constrained firms to bypass prospective investment projects or cancel ongoing investment projects when they are unable to raise external funds. Not only are investments canceled due to financial difficulties, but some firms are even forced to sell profitable assets to secure cash. In fact, the majority of financially constrained firms sold assets to obtain funds for ordinary operations during the economic crisis, whereas financially unconstrained firms did not tend to sell assets (Campello et al., 2010). Financially constrained firms usually hold additional cash reserves as a buffer against potential credit supply shocks (Almeida et al., 2004). They also draw down on their credit line earlier in anticipation of future credit restrictions from banks (Ivashina and Scharfstein, 2009). In

this sense, financial constraints certainly have a negative effect on a firm's capacity for sustainable growth and its position in the market.

In this context, identifying financially constrained firms with reasonable accuracy is critical for restaurant managers not only to mitigate financial risks, but also to promote sustainable business growth. Nevertheless, only a few studies have investigated financial constraints in hospitality academia (Kim and Gu, 2006; Jang and Park, 2011; Kim and Upneja, 2014). Further, since financial constraints are not directly observable, these studies have had difficulties in measuring restaurant firms' financial constraints. For this reason, empirical research has relied on indirect proxies for financial constraint measurements, such as dividend payout ratios (Fazzari et al., 1988; Kaplan and Zingales, 1997), asset tangibility (Bhagat et al., 2005), and credit ratings (Almeida et al., 2004).

Although past studies have attempted to use several ex-ante criteria to classify financially constrained and unconstrained firms, ultimately firms have primarily been divided by simple unilateral criterion. For example, firms in previous studies were initially divided discretely into financially constrained and unconstrained subgroups according to either dividend ratio or firm size, but not simultaneously based on multiple ex-ante criteria. Consequently, the characteristics of financially constrained and unconstrained firms have not been consistent in further studies and have even been contradictory when different ex-ante criteria were used. This issue is attributed to the ways in which the financial constraint levels of large firms with low dividend payments differ from those of small firms with low dividends. Moreover, the financial constraint levels of small firms with high dividend payments also vary from those of small firms with low dividends, although either dividend payout ratio or firm size is an important ex-ante financial constraint criterion. However, they can be distinguished only when multiple ex-ante criteria are

simultaneously considered. Furthermore, many restaurant firms do not pay dividends to their shareholders, thereby making the dividend payout ratio less meaningful when directly applied on its own to restaurant firms as an ex-ante financial criterion.

Therefore, a robust method is needed in order to identify restaurant firms' financial constraints. Accordingly, this study intended to propose a new index that could reflect restaurant firms' unique financial constraint characteristics. When a new index is developed, it also needs to be validated. Thus, this study robust-tested the results driven from the index, which further investigated the effects of financial constraints on the operating cash flow-investment relationship. Therefore, the main objectives of this study were: 1) to identify indicators of financial constraints in restaurant firms; 2) to develop a restaurant firm specific index for financial constraints; and 3) to validate the developed index by examining whether financial constraint influences the relationship between operating cash flow and capital investments. By fulfilling these objectives, restaurant firms' financial constraints can be estimated with more accuracy and, thus, actions taken to address financial constraints can be more effective.

2. **Literature review**

2.1. Ex-ante financial constraint criteria

Fazzari et al. (1988) first suggested that internal fund retention practices could be used as the main criterion for identifying whether firms face the high costs of external financing. Since dividend payments are an internal fund-related practice, dividend payout ratios could be an indicator of a firm's level of financial constraint. Many subsequent studies have also used the

dividend payout ratio as a financial constraint criterion (Cleary, 1999; Almeida et al., 2004; Bhagat et al., 2005; Cleary et al., 2007).

Later, Kaplan and Zingales (1997) empirically and theoretically challenged Fazzari et al.'s (1988) findings with controversial evidence. Their study used management's comments on a firm's liquidity conditions, future needs for funds, and fund sources to determine whether a firm faced financial constraints. As a result of their investigation, they argued that most of the firms that were classified as financially constrained by Fazzari et al. (1988) were not actually financially constrained. They stated that only 15% of the observations that Fazzari et al. (1988) classified as financially constrained showed the possibility of actually being financially constrained.

Instead of using unilateral accounting information, scholars such as Cleary (1999), Lamont et al. (2001), Whited and Wu (2006), and Hovakimian (2009) developed their own financial constraint indexes using multiple variables, such as a firm's profitability, financial leverage, levels of liquidity, growth opportunity, and firm size (Cleary, 1999; Almeida et al., 2004; Bhagat et al., 2005; Whited and Wu, 2006; Cleary et al., 2007). One of the most well-known financial constraint indexes was the Kaplan and Zingales index (or KZ index) (Kaplan and Zingales, 1998). The KZ index was calculated using operating cash flow, Tobin's Q, financial leverage, the dividend payout ratio, and cash holdings (KZ index = -1.002*cash flow + 0.283*Tobin's Q + 3.139*financial leverage - 39.368*dividends - 1.315*cash holdings). Cleary (1999) also developed a beginning-of-period financial constraint index (hereafter referred to as the Cleary index and denoted as Z_{fc}) by using multiple discriminant analysis: Z_{fc} = 0.1191*current ratio + 1.9037 *debt ratio - 0.0014*fixed charge coverage - 1.4562* net income - 2.0360*sales growth + 0.0477*financial slack. To develop a financial constraint index, Kaplan

and Zingales (1998) used subjective measurements for ex-ante financial constraint criteria, while Cleary (1999) created three mutually exclusive groups based on the dividend payout ratio: firms' increased dividends, cuts to dividends, and unchanged dividends.

Despite the development of these sophisticated financial constraint indexes, one of the critical limitations of both the KZ index and the Cleary index was that the firms were classified by a subjective or single ex-ante financial constraint criterion. To overcome this weakness, more robust ex-ante classification of financial constraints is needed. Thus, this study considered three previously verified ex-ante criteria simultaneously: the dividend payout ratio, KZ index, and Cleary index (Figure 1). For all ex-ante criteria, this study used the mean values of the restaurant industry average of the three criteria. Consequently, we proposed a composite index to enhance the accuracy of measuring financial constraints, which means that the nature of our index is more conservative than past indexes.

(Insert Figure 1 Here)

2.2. Potential indicators of restaurant firms' financial constraints

One of the most distinctive features of financially constrained firms is that they are less profitable than financially unconstrained firms (Kaplan and Zingales, 1997; Cleary, 1999; Allayannis and Mozumdar, 2004; Cleary et al., 2007; Hovakimian, 2009). The negative relationship between a firm's profitability and financial constraints is consistent, even after excluding firms with negative cash flows. In Kaplan and Zingales's (1997) study, the average cash flow over capital ($Cash\ flow_t/K_{t-1}$) was much higher for financially unconstrained firms than for financially constrained firms (0.506 vs. 0.020). In addition, the ratio constantly decreased as the level of financial constraint increased. Cleary (1999) also found similar results.

The average net income margin (net income/sales) was much higher (6.8%) for financially unconstrained firms than for financially constrained firms (6% vs. 1%).

Later, Allayannis and Mozumdar (2004) also found that profitability constantly decreased as financial constraints increased: the average net income (net income/sales) was lowest for financially constrained firms, second lowest for potentially financially constrained firms, and highest for financially unconstrained firms (3.74%, 5.38%, and 6.47%, respectively). According to Hovakimian (2009), the most financially constrained firms had the lowest operating cash flows and the least financially constrained firms had the highest operating cash flows. In addition, more financially constrained firms showed significantly lower profitability in terms of operating performance than less financially constrained firms. Therefore, this study proposed the following hypothesis:

Hypothesis 1a: As a restaurant firm's operating profit increases, it is less likely to be financially constrained.

According to Mun and Jang (2015), restaurant firms are unique in that they rely on suppliers' credits (e.g., accounts payable) for ordinary operations. They also found that restaurant firms maintained very tight working capital, with similar amounts of current assets and current liabilities. Under these circumstances, if a restaurant firm is more financially constrained, then it tends to rely more on suppliers' credit than less financially constrained firms for two reasons. First, suppliers' credit is one of the least expensive sources of operational funds. Second, there are fewer restrictions on obtaining and redeeming suppliers' credit than public debt. In other words, when a restaurant firm cannot obtain favorable external financing due to transaction costs

or information asymmetry, it is fairly common for the firm to delay payment on credit purchases (Mun and Jang, 2015). In this sense, accounts payable could represent a firm's financial constraints. Thus, this study hypothesized:

Hypothesis 1b: As a restaurant firm's accounts payable increase, it is more likely to be financially constrained.

Past studies (e.g., Moyen, 2004; Bhagat et al., 2005; Whited and Wu, 2006) have suggested that more financially constrained firms tend to have higher financial leverage than less financially constrained firms. Other past studies (e.g., Jensen and Mecking, 1976) claimed that high financial leverage impedes firms from accessing external financing markets due to firms' decreased debt capacity. Furthermore, when firms have a large amount of debt, the available amount of liquid assets for investment is restricted due to the burden of interest expenses. Both Fazzari et al. (1988) and Kaplan and Zingales (1997) stated that firms' financial leverage increased monotonically by the level of financial constraint, supporting the importance of debt financing as a resource for capital investment. Cleary (1999) also confirmed that firms are inclined to cut rather than increase dividends when they have higher financial leverage.

However, Moyen (2004) argued that financially unconstrained firms mainly use debt financing for capital investments due to the associated tax benefits. Financially unconstrained firms also tend to take on more debt than financially constrained firms because financially unconstrained firms can change their debt levels with relatively less friction. Similarly, Bhagat et al. (2005) provided empirical evidence that more financially constrained firms have lower financial leverage than less financially constrained firms. They also noticed that the financial

leverage of financially distressed firms was higher than that of the most financially constrained firms. Based on these distinct financial features of financially distressed firms, Bhagat et al. (2005) suggested that financially distressed firms' financial behaviors are quite different not only from financially unconstrained firms but also from financially constrained firms.

From another angle, Cleary et al. (2007) found that financially distressed firms with negative cash flows had higher financial leverage than financially distressed firms with positive cash flows. More interestingly, Hovakimian (2009) reported that financially distressed firms with negative cash flows showed higher financial leverage than financially constrained firms with positive cash flows. However, Hovakimian (2009) did not find a significant difference between the financial leverage of financially distressed firms with negative cash flows and financially unconstrained firms, even when the financially unconstrained firms had positive cash flows. These findings indicated that financially unconstrained firms may have higher financial leverage than financially constrained firms, but this does not necessarily mean that higher financial leverage decreases a firm's level of financial constraint. These findings may imply that in the restaurant industry less financially constrained firms may have higher financial leverage than more financially constrained firms, but financial constraint increases with financial leverage. Thus, this study hypothesized the following:

Hypothesis 1c: As a restaurant firm's financial leverage increases, it is more likely to be financially constrained.

In addition to firm size, financially constrained firms demonstrate lower asset tangibility than financially unconstrained firms (Bhagat et al., 2005; Almeida and Campello, 2007;

Hovakimian, 2009). Bhagat et al. (2005) used dividend payout ratios to classify each firm's level of financial constraint and employed the asset tangibility ratio to check the robustness of the results. They suggested that firms with fewer tangible assets face greater information asymmetry than firms with more tangible assets. Similarly, Almeida and Campello (2007) suggested that if a firm had greater access to external debt financing, then it would increase capital investments. In other words, increased capital investments may improve both a firm's tangible assets and access to credit due to the increased collateral value that creditors would claim when it defaults. That is, a firm's tangibility assets display a virtuous cycle with access to credit. Thus, asset tangibility may be an important proxy for financial constraints, to which it is negatively related. Hovakimian (2009) supported this idea from a different perspective by stating that firms with low asset tangibility are more likely to have higher growth opportunities, which causes greater information asymmetry. He indicated that the coefficient of asset tangibility implied that it had a strong negative causal relationship with the level of a firm's financial constraints and the results were consistent. In a restaurant business setting the rationale of the negative effects of asset tangibility on financial constraints is even more plausible because a restaurant's level of tangible assets is closely related to the number of store units used as collateral. Thus, this study proposed the following hypothesis:

Hypothesis 1d: As a restaurant firm's asset tangibility increases, it is less likely to be financially constrained.

A firm's operational efficiency is usually improved when its retained assets have a comparative advantage. Corporate managers tend to be reluctant to sell fixed assets unless the

alternative financing source is too expensive or unfavorable (Lang et al., 1995). That is, since restaurant properties are critical to sustaining the business, fixed assets are voluntarily sold only when a firm does not have any more cost-effective financing sources in the face of financial constraints. Indeed, Shleifer and Vishny (1992) and Asquith et al.'s (1994) findings implied that voluntary sales of assets could be a financing source of last resort for firms with financial difficulties. Campello et al. (2010) also found that CFOs of financially constrained firms sold more assets during the crisis than before it compared with financially unconstrained firms. Therefore, expecting the sale of fixed assets to be significantly related to the level of a firm's financial constraint is reasonable. Thus, this study proposed the following hypothesis:

Hypothesis 1e: As a restaurant firm's sale of fixed assets increases, it is more likely to be financially constrained.

When a firm faces extremely poor operational and financial conditions, organizational restructuring is often required to overcome the difficulties. Restructuring takes many different forms, such as downsizing, relocating, exiting, etc. In many cases, organizational restructuring also causes significant employee layoffs (Datta et al., 2010). In less severe cases, a manager may downsize the number of employees, tighten human resource management, or not hire new employees. Thus, a change in the number of employees can be an important indicator of a firm's financial condition. The restaurant industry in particular is labor intensive and salary expenses account for a significant portion of overall operating costs. A restaurant firm tends to increase or decrease employees according to operational necessities and financial difficulties. Therefore, the number of employees increases when a firm is in the growth stage and financially unconstrained,

but decreases when it has fewer growth opportunities and is more financially constrained. Thus, this study proposed the following hypothesis:

Hypothesis 1f: As a restaurant firm's number of employees increases, it is less likely to be financially constrained.

The variables proposed above are potential indicators for identifying a restaurant firm's level of financial constraint. This study found the parameter estimate of each indicator and subsequently proposed a restaurant firm financial constraint (hereafter RFC) index. Using the proposed RFC index, each firm's level of financial constraint can be calculated. Using the calculated index values, the firms were divided into groups based on levels of financial constraint. Finally, this study examined the relationship between operating cash flows and capital investments in order to verify whether the proposed index was valid for identifying financial constraint. If the relationship between operating cash flows and capital investments was weaker for restaurant firms with more financial constraints than those with less financial constraints, then the proposed RFC index would be valid and reliable. This type of validation method has commonly been used in past financial constraint index studies (e.g., Clearly, 1999; Lamont et al., 2001; Whited and Wu, 2006; Hovakimian, 2009). The following section provides the academic rationale for the relationships among financial constraints, operating cash flows, and capital investments used in this validation method.

2.3. Financial constraint, operating cash flow, and capital investments

The relationship between operating cash flows and capital investments is known to be positive for restaurant firms (Park and Jang, 2013). However, restaurant firms' investment behaviors are based not only on operating cash flows but are also associated with financial constraint conditions, which has not been directly examined. The funds (both external and internal) available to a financially constrained restaurant firm for capital investment are always less than those available to financially unconstrained firms (Povel and Raith, 2001) for two reasons. First, financially constrained firms have more difficulty accessing public debt markets. Even if a firm can obtain external debt, the covenants for debt are stricter for financially constrained firms than for financially unconstrained firms. Second, the flexibility of internal funds is also more limited for financially constrained firms than for unconstrained firms. Almeida et al. (2004) strongly asserted that financially constrained firms have a stronger propensity to hoard cash for future necessities at the expense of opportunity costs. Consequently, if all other conditions are the same, the amount of capital investments made by financially constrained firms will always be smaller than for financially unconstrained firms (Cleary et al., 2007). Thus, even though the relationship between operating cash flows and capital investments would be positive, the degree of the relationship may be lower for more financially constrained restaurant firms than for less financially constrained restaurant firms. Similar to our claim, Upneja and Sharma (2009) compared small and large restaurant firms and found a weaker relationship between operating cash flows and capital investments for small restaurant firms than for large restaurant firms due to small firms' greater degree of financial constraints.

On the other hand, Allayannis and Mozumdar (2004) disclosed the effects of negative cash flow on overall investment-cash flow sensitivity by revisiting the studies of Kaplan and Zingales (1997) and Cleary (1999). They argued that when a firm faces sufficiently poor

financial conditions, it makes only essential investments if operating performance declines. Allayannis and Mozumdar (2004) also pointed out that the overall cash flow-investment relationship of financially constrained firms tends to be weak because only a handful of firms have a negative operating cash flow. In that respect, they showed that the cash flow-investment relationship significantly increased after removing some firms with negative cash flows from the analysis sample. They also claimed that a few extreme observations in Kaplan and Zingales's (1997) study sample were problematic because they significantly altered the overall cash flow-investment relationship.

Other studies have also found a negative relationship between operating cash flows and capital investments for firms with negative cash flows (Povel and Raith, 2001; Bhagat et al., 2005; Cleary et al., 2007; Hovakimian, 2009). The negative relationship between operating cash flows and capital investments indicates that when firms with negative operating cash flows are included in the analysis, they should be examined with caution due to their counter effects on overall cash flow-investment sensitivity. Despite past evidence of a negative relationship between operating cash flow and capital investments in firms with negative operating cash flows (e.g., Povel and Raith, 2001; Bhagat et al., 2005; Cleary et al., 2007; Hovakimian, 2009), this may not be exactly the same case in the restaurant industry. If a restaurant firm faces poor operational conditions, capital investments are not typically the first option to overcome operational difficulties. Instead, many restaurant firms facing operational difficulties decrease their spending on capital investments and tighten their capital budgets. In addition, it is more difficult for restaurant firms with negative operating cash flows to obtain sufficient equity financing or debt financing for capital investments beyond operational purposes. Therefore, it is

not reasonable to expect capital investments to increase monotonically with operating cash flows in restaurant firms with negative operating cash flows.

Nevertheless, restaurant firms with negative operating cash flows tend to maintain a minimum level of capital investments, regardless of the level of operating cash flow deficiency, because investment decisions may depend on external funds (Mun and Jang, 2017). In other words, there is no systematic relationship between operating cash flows and capital investments in restaurant firms with negative operating cash flows. Therefore, for firms with negative operating cash flows there is no consistent pattern in the relationships between operating cash flows and capital investments across different levels of financial constraint. Thus, this study proposed the following hypotheses:

Hypothesis 2a: The positive relationship between operating cash flows and capital investments is weaker for more financially constrained firms than for less financially constrained firms when restaurant firms have positive operating cash flows.

Hypothesis 2b: There is no consistency in the relationship between operating cash flows and capital investments across different levels of financial constraint for restaurant firms that have negative operating cash flows.

3. Methodology

3.1. Samples and data

This study used the financial data of U.S. restaurant firms from the COMPUSTAT database with a Standard Industrial Code of 5812 from 1963 to 2014. Observations with

significant amounts of missing data were eliminated and the final sample used in the analysis included a total of 4,201 observations of unbalanced panel data.

Dividend payout ratio, KZ index, and Cleary index were used as a composite criterion for financial constraint in this study. It is important to note that a firm could be classified as financially constrained in one year, but as financially unconstrained in another year.

3.2. Models and variables

To estimate restaurant firms' financial constraints, logistic regression was employed using a composite criterion based on the dividend payout ratio, KZ index, and Cleary index, which was a dependent variable. The more financially constrained restaurant firms (1) included firms that had lower dividend payout ratios, a higher KZ index, and a higher Cleary index than the restaurant industry average at the time. The less financially constrained restaurant firms (0) included firms that had higher dividend payout ratios, a lower KZ index, and a lower Cleary index than the restaurant industry average at the time.

In this logistic regression model, the independent variables were the ratio of operating profit to total revenue, the ratio of accounts payable to working capital, the ratio of total debts to total assets, the ratio of fixed assets to total assets, the ratio of the sale of fixed assets to total assets, and the percentage change in employee numbers. GDP growth was used as the control variable to remove the effects of economic changes on the relationships between the independent and dependent variables.

Of the six independent variables (operating profit, accounts payable, financial leverage, asset tangibility, sale of fixed assets, and the % change in number of employees), accounts payable was not statistically significant in the first-run logistic regression (Table 3). Thus, only

five independent variables (accounts payable was excluded) and a control variable were included in the model to estimate restaurant firms' financial constraint as follows:

$$Financial\ constraint\ (binary\ variable) = \alpha + \beta_1 * Operating\ profit + \beta_2 * Financial\ leverage + \beta_3 * Asset\ tangibility + \beta_4 * Sale\ of\ fixed\ assets + \beta_5 * \%\ change\ in\ number\ of\ employees + \beta_6 * GDP\ growth + \varepsilon \quad \text{(Model 1)}$$

The main purpose of model 1 shown above was to estimate the parameters of indicators (independent variables) that can lead to financial constraint and to propose a model to calculate each restaurant firm's financial constraint (RFC) index. As previously mentioned, logistic regression was used in the model to obtain the parameter estimate (the coefficient) of each independent variable. Next, each restaurant firm financial constraint (RFC) index was calculated by multiplying the coefficient with its corresponding variable value for each firm, which is the same method used by Cleary (1997) and Lamont et al. (2001). To check if the calculated indexes were a valid method for identifying financial constraint, all restaurant firms were classified into four groups based on each restaurant firm's financial constraint (RFC) index values. Further, the relationships between operating cash flows and capital investments were compared among the groups to verify whether or not financial constraint was well detected by the proposed financial constraint-identifying index.

In the second model, the dependent variable was the ratio of capital investments to total assets and the independent variable was the ratio of operating cash flows to total assets. Five control variables were used based on Cleary et al. (2007): firm size, market-to-book value ratio, sales growth rate, financial leverage, and GDP growth. The market-to-book value ratio and sales

growth rate are significantly related to a firm's investment decisions. Thus, they were used as proxies for restaurant firm growth opportunity. The market-to-book value ratio is also the most commonly used proxy variable for growth opportunity in previous studies of investment-cash flow sensitivity. Firm size and financial leverage were used to control the debt capacity of restaurant firms.

The analysis of the second model used a fixed-effects regression to consider firm-specific and year effects. A Hausman test was performed to choose between a fixed-effects and random-effects model. The results showed that the random-effects model was inconsistent due to endogeneity issues in the unobserved errors. For further analysis, the firms with positive operating cash flows were separated from the firms with negative operating cash flows. Each group was then divided into four groups based on RFC indexes. In all of the group analyses, robust standard errors were used to avoid heteroscedasticity among the variables.

$$\frac{Capitalinvest}{Total\ assets}_{it} = \alpha + \beta_1 * \frac{OperatingCashflow}{Total\ assets}_{it} + \beta_2 * Firm\ size_{it} + \beta_3 * Market\ to\ book_{it} + \beta_4 * Sales\ growth_{it} + \beta_5 * Financial\ leverage_{it} + \beta_6 * GDP\ growth_t + u_i + \varepsilon_{it}$$

(Model 2)

4. Results

4.1. Profiles of more financially constrained vs. less financially constrained groups

Table 1 shows the mean values of variables of interest for the more financially constrained and less financially constrained groups. High and low were decided based on the

mean value of each financial constraint criteria. When the groups were divided by dividends, the low group had more financial constraints, while the high group had less financial constraints. The high KZ index group, with a KZ index value greater than 0.6465, and the high Cleary group, with a Cleary index greater than 0.9262, were more financially constrained. In contrast, KZ index and Cleary index values of less than 0.6465 and 0.9262, respectively, were categorized as less financially constrained. As explained earlier, this study intended to combine all three factors (dividends, KZ index, and Cleary index) into one composite criterion, which is shown in the two far right-side columns of Table 1. Thus, the high Composite criterion group has low Dividends, a high KZ index, and a high Cleary index, which indicates more financially constrained firms. Overall, the left column of each criterion reveals more financial constraint, whereas the right column of each criterion shows less financial constraint.

In three groups (except for the group based on the Cleary index), more financially constrained firms had a much smaller firm size than less financially constrained firms. Also, the cash ratio was larger for more financially constrained firms than less financially constrained firms (Bates et al., 2009; Denis and Sibilkov, 2010) for three groups (except for the group based on the KZ index). In all four groups, the ratio of operating cash flows was much lower for more financially constrained firms than less financially constrained firms. The capital-investment ratio for more financially constrained firms was not very different from less financially constrained firms. The market-to-book ratio was somewhat higher for more financially constrained firms than for less financially constrained firms in all four groups, whereas the sales growth rate was lower for more financially constrained firms for the groups that used the Cleary index and the Composite criterion. The operating profit and net profit were lower for more financially constrained firms than for the less financially constrained firms in three groups (except for the

group based on the KZ index). The dividend ratio was lower for the more financially constrained firms in three groups (except for the group based on the Cleary index). The financial leverage ratio was much higher for the more financially constrained firms in all four groups. The ratio of current assets to current liabilities was higher for the more financially constrained firms in three groups (except for the group based on the KZ index). The asset tangibility ratio was lower for more financially constrained firms (except for the group based on the KZ index).

(Insert Table 1 Here)

As presented in Table 2, the KZ index showed the most inconsistency when compared with expected differences between more and less constrained restaurant firms. Out of the twelve variables of interest, the KZ index missed eight expectations for restaurant firms. Dividends and the Cleary index did not match two of the expectations. However, the proposed Composite criterion that combined all three (Dividends, KZ index, and Cleary index) were consistent with all expectations. This result demonstrates that the Composite criterion is the most robust indicator of financial constraint for restaurant firms. The following section provides an explanation of how the composite criterion was used to determine the RFC index.

(Insert Table 2 Here)

4.2. Restaurant firm financial constraint (RFC) index

As explained in the methodology section, logistic regression was used to estimate the coefficients of potential indicators that could lead to financial constraint. For the logistic

regression the dependent variable was dichotomous (1 or 0). This study used 1 for more financially constrained firms (High group based on Composite criterion) and 0 for less financially constrained firms (Low group based on Composite criterion). In this way, Composite criterion was utilized to find the parameter estimates of indicators in the logistic regression analysis. As independent variables, six variables (operating profit, accounts payable, financial leverage, asset tangibility, sale of fixed assets, and the % change in number of employees) were inserted into the logistic regression.

As shown in Table 3, in the first logistic regression accounts payable/working capital was not statistically significant, although the sign was consistent with expectations (positive). Thus, the result did not support Hypothesis 1b. However, the five other variables were statistically significant and consistent with expected signs. Since this study sought a model that could more accurately identify financial constraint for restaurant firms, a second logistic regression was completed using only the significant variables, which is Model 1 in the methodology section. Results of the second logistic regression revealed that operating profitability, asset tangibility, and percentage change in number of employees significantly decreased the probability of restaurant firms being classified as financially constrained, whereas financial leverage and the sale of fixed assets increased the possibility of being financially constrained. Thus, the results supported Hypotheses 1a, 1c, 1d, 1e, and 1f. The Pseudo R^2 was 74.12% and the chi-square was statistically significant at the 1% significance level.

Next, the parameter estimates from the second logistic regression were used to provide a RFC index following the KZ index and Cleary index. That is, the coefficient of each independent variable was multiplied by each firm's variable value to calculate the restaurant firm's financial constraint (RFC) index. As noted in Table 1, Composite criterion was found to be the most valid

option for identifying financial constraint for restaurant firms, whereas the KZ index by itself presented the most inconsistent indicator and the Cleary index by itself showed contradictory results for two of the most important characteristics, firm size and dividends. The outcome of the Composite criterion, whether each firm was more or less financially constrained, was used to estimate the coefficients of the logistic regression. Thus, this study argues that the RFC index derived from the resulting coefficients is much more appropriate for restaurant firms than Dividends, the KZ index, or the Cleary index alone. Therefore, this study proposed the following equation to calculate the RFC index:

RFC Index = - 21.5772*operating profit/revenue + 12.1807*total liabilities/total assets - 11.0991*asset tangibility + 15.1570*sale of fixed assets/total assets - 0.2806*% change in number of employees

As mentioned earlier, it was also necessary to examine whether the proposed RFC index functions well for restaurant firms. Thus, this study investigated the relationships between operating cash flows and capital investments across different groups based on RFC index values. Taking into account all index value calculations, the mean RFC value was -2.6087 (median: -4.0274; highest: 343.4658; lowest: -51.0967). As hypothesized, the following analyses were conducted separately for positive operating cash flows (Hypothesis 2a) and for negative operating cash flows (Hypothesis 2b).

(Insert Table 3 Here)

4.3. The relationship between operating cash flow-capital investment across different levels of financial constraint

4.3.1. Restaurant firms with positive operating cash flows

Before examining the relationship between operating cash flows and capital investments, this study divided restaurant firms with positive operating cash flows into four groups based on RFC index values: highest (4st Q; between 80.8892 and -1.0526), high (3rd Q; between -1.0526 and -4.3711), low (2nd Q; between -4.3711 and -7.1893), and lowest (1st Q; between -12.6065 and -51.0967) quartiles. The highest RFC quartile group included the most financially constrained firms, whereas the Lowest RFC quartile included the least financially constrained firms. This study then examined the effects of operating cash flows on capital investments across the four groups to see whether financial constraint could have a monotonic effect on the cash flow-investment relationship. As shown in Table 4, the operating cash flow–capital investment sensitivity monotonically changed as the level of financial constraint changed for firms with positive cash flows. The coefficient of operating cash flow for the most financially constrained firms (highest RFC quartile) was the lowest (12.03%), but the coefficient of operating cash flows for the least financially constrained firms (lowest RFC quartile) was the highest (44.84%). In other words, the magnitude of the relationship between operating cash flows and capital investments for the more financially constrained firms was weaker than that of less financially constrained firms when they had positive operating cash flows, which supported Hypothesis 2a. Cash flow-investment sensitivity constantly decreased as firms' financial constraints increased, indicating that financial constraint has a negative effect on the relationship between operating cash flows and capital investments. The results evidenced that the division of the four groups

was appropriate, which suggests that the RFC index is suitable for restaurant firms with positive operating cash flows.

(Insert Table 4 Here)

4.3.2. Restaurant firms with negative operating cash flows

Like the positive operating cash flow case above, this study first divided restaurant firms with negative operating cash flows into four groups based on RFC index values: highest (4st Q; between 343.4658 and 8.9274), high (3rd Q; between 8.9274 and 2.4543), low (2nd Q; between 2.4543 and -1.2173), and lowest (1st Q; between -1.2173 and -10.3401) quartiles. As presented in Table 5, the relationships between operating cash flows and capital investments were not consistent across different levels of financial constraint, which was consistent with Hypothesis 2b. Of the four groups, operating cash flows showed a significant effect on capital investments only for the group with high financially constrained restaurant firms and negative operating cash flows (High RFC quartile). That is, when restaurant firms had negative operating cash flows, they maintained essential capital investments until financial constraints became very serious. Further, based on the smallest parameter estimate, restaurant firms with extremely bad financial constraints (Highest RFC quartile) made only a minimal amount of investments, but the relationship between cash flow and investment was still significant. It seems that restaurant firms with negative cash flows make an effort to survive and find a way-out through additional investments even under serious financial constraints. On the other hand, for both the low and lowest RFC quartiles (meaning less financial constraints), firms with negative cash flows had relatively larger coefficients of operating cash flows. However, the relationships between cash

flows and investments were not significant due to huge standard errors. This result indicates that restaurant firms with less financial constraints do not show consistent investment behaviors under negative operating cash flow situations. In sum, capital investment behaviors based on operating cash flows were not consistent across different levels of financial constraints as hypothesized. Overall, the results indicated that the four groups with negative operating cash flows divided by RFC index values showed inconsistent investment behaviors. As a result of this section, even though the analysis results might not be concrete evidence that the RFC index is entirely valid, they at least suggest the possibility that the RFC index could be valid for restaurant firms with negative operating cash flows.

(Insert Table 5 Here)

5. Discussion and conclusions

5.1 Conclusions

The goal of this study was to develop a new index that could identify a restaurant firm's financial constraints. To achieve that goal, this study found potential indicators of financial constraints, made a composite criterion using past indexes, developed a model with potential indicators, proposed a new index, and finally validated the proposed index. This study found that five indicators were significantly important for identifying financial constraint for restaurant firms. Using logistic regression analysis with those five indicators, this study proposed a new index, the restaurant firm financial constraint (RFC) index, which can calculate the level of financial constraint. For validation purposes, this study also examined the relationship between operating cash flows and capital investments across different levels of financial constraint based

on RFC index values. The results showed that the relationship between operating cash flows and capital investments for more financially constrained firms was weaker than for less financially constrained firms if the restaurant firms had positive cash flows. However, the relationship was not consistent across various levels of financial constraint when restaurant firms had negative operating cash flows. The results suggested that the RFC index is suitable for restaurant firms. Theoretically, this study supports the concept that financial constraint exerts a strong influence on a firm's investment–cash flow sensitivity (Fazzari et al., 1988; Almeida et al., 2004; Cleary et al., 2007). Moreover, the findings provide evidence that the effect of financial constraint on a firm's investment–cash flow sensitivity is not monotonic (Povel & Raith, 2001; Bahgat et al., 2005; Cleary et al., 2007; Hovakimian, 2009). Furthermore, this study confirmed that the proposed RFC index is superior to past criteria, such as dividend payout ratio, KZ index, and Cleary index, in terms of identifying a restaurant firm's financial constraints.

This study differs from previous studies of financial constraints. Along with past ex-ante financial constraint criteria, this study included unique financial and operational characteristics of restaurant firms to determine financial constraint indicators, such as sale of fixed assets and percentage change in number of employees. Thus, the RFC index better reflects conventional business characteristics in the restaurant industry. Of the financial constraint indicators, the amount of sales of fixed assets had a stronger explanatory power for the probability of a firm's financial constraint status than the amount of debts and tangible assets. This indicates the uniqueness of the model this study used to determine restaurant firms' financial constraints.

5.2 Implications

This study is practically meaningful in that the proposed RFC index can actually be used to measure the level of financial constraint and compare the calculated RFC index value with the pivot numbers presented in Tables 4 and 5. That is, if a restaurant firm has positive operating cash flow and a RFC index value greater than -4.3711, then the firm should be considered more financially constrained. In case of negative operating cash flows, if a firm has a RFC Index greater than 2.4543, then the firm should be considered more financially constrained. Even though boundary numbers can vary slightly depending on the data used and the period of interest, this method can easily be updated as needed, following the procedure suggested by this study. Clearly, the RFC index provides a new method for understanding where a firm is situated in terms of financial constraints within a comparison set.

By contrast, restaurant managers may utilize the RFC index value to enhance their short-term and long-term cash management, inventory control, and accounts payable practices. For example, if a restaurant firm has a higher RFC index value than its competitors, then the firm should hold more liquid assets (e.g., cash, inventory, accounts receivable) than fixed assets to avoid unexpected cash shortfalls and vice versa. That is, an appropriate understanding of a firm's level of financial constraint is clearly beneficial for restaurant managers not only to avoid short-term budgetary risks but also to grasp long-term growth opportunities. Furthermore, this study can be expanded to hotels and other tourism industries because external financing is an essential element in the operation of most hotels and tourism companies. Despite its importance, minimal attention has been afforded to the effect of financial constraint on firm performance, whereas extensive studies have investigated performance measurements for hotel and tourism companies (Sainaghi, 2010; Sainaghi, Phillips, & Zavarrone, 2017; Altin et al., 2018). In this regard, the current study can connect performance measurements with a firm's financial constraint level.

Moreover, the proposed RFC index is valuable for those providing external capital who need to determine credit policies for restaurant firms. Therefore, this study's composite index serves the managers of hospitality and tourism companies and their external stakeholders because it improves the understanding of a restaurant firm's financial situation.

5.3 Limitations and future research

However, this study is not free of limitations. This study proposed an RFC index that is specifically valid for restaurant firms. Thus, the proposed index is not directly applicable to other industries that have different operating characteristics and growth opportunities. In addition, this study did not examine an absolute point for financially constrained or unconstrained firms, which could be covered by follow-up studies. Further, this study can be useful for understanding the effects of financial constraints on management strategies in the restaurant industry, such as liquidity management, marketing strategies, human resource management, financing decisions, and mergers and acquisitions. With the calculated RFC index values, it would be possible to directly investigate the effects of financial constraint on management strategies.

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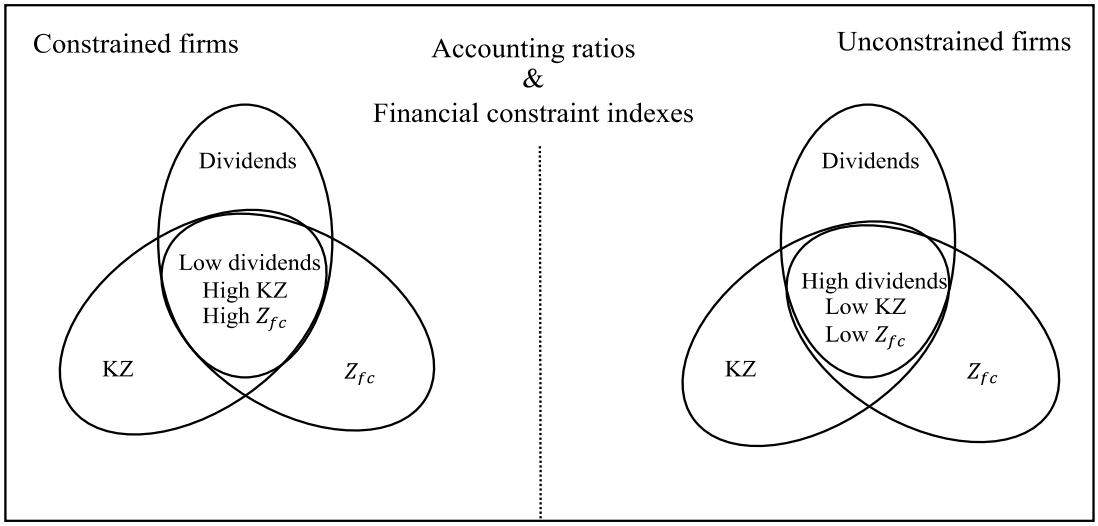

Figure 1. Financially constrained firms vs. unconstrained firms

Table 1. Profiles of more financially constrained and less financially constrained groups

Financial constraint Criteria	Dividends		KZ index		Cleary index		Composite criterion (Dividends, KZ index, & Cleary index)	
Variables	Low	High	High	Low	High	Low	High	Low
Assets (million USD)	213.37	1,095.00	268.74	1,286.96	827.03	155.93	14.54	984.00
Cash/Total Assets	0.12	0.10	0.10	0.13	0.12	0.09	0.15	0.03
OCF/Total Assets	0.06	0.12	0.05	0.12	0.06	0.11	-0.15	0.15
CAP/Total Assets	0.14	0.14	0.14	0.13	0.12	0.17	0.13	0.14
Market-to-book	1.83	1.76	1.81	1.79	1.96	1.62	2.41	1.68
Sales growth	0.35	0.16	0.30	0.22	0.11	0.47	0.09	0.20
OP/Sales	-0.06	0.03	-0.03	-0.03	-0.08	0.04	-0.35	0.10
Net profit/Sales	-0.07	-0.05	-0.05	-0.09	-0.15	0.06	-0.37	0.05
Dividends/Net income	0.00	2.45	0.75	1.37	1.49	0.13	0.00	0.63
Financial leverage	0.37	0.33	0.42	0.19	0.42	0.26	0.54	0.23
CA/CL	1.80	1.22	1.20	2.57	1.97	1.04	1.59	0.56
Asset Tangibility	0.58	0.59	0.59	0.58	0.55	0.64	0.54	0.74

Note: OCF is operating cash flow; CAP is capital investment; OP is operating profit; CA is current assets; CL is current liabilities; Asset Tangibility is fixed assets over total assets; High in KZ index when KZ >0.6465, otherwise Low; High in Cleary index when Cleary >0.9262, otherwise Low.

Table 2. Expectations for more and less constrained restaurant firms

	(Expectations) More constrained Firms	(Expectations) Less constrained firms	Inconsistent results with expectations
Assets	L(Low)	H(High)	Cleary index
Cash/Total Assets	H	L	KZ index
OCF/Total Assets	L	H	-
CAP/Total Assets	L	H	Dividends, KZ index
Market-to-book	H	L	-
Sales growth	L	H	Dividends, KZ index
OP/Sales	L	H	KZ index
Net profit/Sales	L	H	KZ index
Dividends/Net Income	L	H	Cleary index
Financial leverage	H	L	-
CA/CL	H	L	KZ index
Asset Tangibility	L	H	KZ index

Note: OCF is operating cash flow; CAP is capital investment; OP is operating profit; CA is current assets; CL is current liabilities; Tangibility is fixed assets over total assets.

Table 3. Logistic regressions for the restaurant firm financial constraint (RFC) index

Dependent variable	More constrained firms (1) vs. Less constrained firms (0)	
Independent variables	1st Logistic Regression with Accounts Payable	2nd Run Logistic Regression Without Accounts Payable (Model 1)
Operating profit/ Sales	-21.4634*** (3.2174)	-21.5772*** (3.2203)
Accounts payable/ Working capital	0.0304 (0.0392)	-
Financial leverage	12.1441*** (1.1558)	12.1807*** (1.5617)
Asset tangibility	-11.0375*** (1.5343)	-11.0991*** (1.5232)
Sale of fixed assets/ Assets	15.5159** (6.5236)	15.1570** (6.4882)
Percentage change in employee number	-0.2810*** (0.0873)	-0.2806*** (0.0879)
GDP growth	-0.0816 (0.1254)	-0.0850 (0.1249)
Constant	4.8297*** (1.0320)	4.9562*** (1.0285)
Observations	499	508
LR chi square (6)	432.82***	437.49***
Pseudo R^2	0.7404	0.7412

Note: Asset tangibility is fixed assets over total assets; *significant at 10%; **significant at 5%; ***significant at 1%.

Table 4. The effect of operating cash flow on capital investments across four different levels of financial constraint for firms with positive operating cash flows

Independent variables	Dependent variable: Capital investment/Asset			
	Highest RFC quartile (80.8892~-1.0526)	High RFC quartile (-1.0526 ~ -4.3711)	Low RFC quartile (-4.3711~ -7.1893)	Lowest RFC quartile (-7.1893~ -51.0967)
Operating cash flow/Asset	0.1203*	0.2382**	0.2657**	0.4484***
	(0.0645)	(0.1125)	(0.1318)	(0.1533)
Log (Total assets)	-0.0159**	-0.0144	-0.0229**	-0.0371***
	(0.0064)	(0.0144)	(0.0093)	(0.0082)
Market-to-book	0.0170***	-0.0052	0.0031	-0.0008
	(0.0061)	(0.0058)	(0.0085)	(0.0083)
Sales growth	0.0184	0.0319	0.1285***	0.1985***
	(0.0144)	(0.0208)	(0.0322)	(0.0460)
Financial leverage	-0.0164	0.0933	0.0922*	0.0480
	(0.0138)	(0.0747)	(0.0509)	(0.0770)
GDP growth	0.0055***	0.0031	0.0011	0.0022
	(0.0020)	(0.0031)	(0.0021)	(0.0018)
Constant	0.1350***	0.1048	0.1586***	0.2356***
	(0.0378)	(0.0746)	(0.0398)	(0.0564)
Observations	735	287	419	492
Adjusted R^2	0.1193	0.0806	0.1845	0.4471

Note: Financial leverage is debts in current liabilities and long-term debts over assets; *significant at 10%; **significant at 5%; ***significant at 1%.

Table 5. The effect of operating cash flow on capital investments across four different levels of financial constraint for firms with negative operating cash flows

Independent variables	Dependent variable: Capital investment/Asset			
	Highest RFC quartile (343.4658 ~ 8.9274)	High RFC quartile (8.9274 ~ 2.4543)	Low RFC quartile (2.4543 ~ -1.2173)	Lowest RFC quartile (-1.2173 ~ -10.3401)
Operating cash flow/Asset	0.0238***	0.4943*	0.3587	0.4864
	(0.0050)	(0.2693)	(0.2506)	(0.5885)
Log (Total assets)	0.0531**	0.0228	-0.1769	0.0091
	(0.0209)	(0.0474)	(0.1412)	(0.0431)
Market-to-book	-0.0015	0.0389*	0.0121	0.0285
	(0.0160)	(0.0219)	(0.0097)	(0.0276)
Sales growth	0.0032	-0.0104	-0.1523	0.1551**
	(0.0043)	(0.0234)	(0.0930)	(0.0688)
Financial leverage	0.0208	-0.2599	-0.0638	-0.1815
	(0.0211)	(0.1781)	(0.1162)	(0.2770)
GDP growth	0.0074	0.0017	0.0121	-0.0071
	(0.0078)	(0.0109)	(0.0165)	(0.0152)
Constant	-0.0534	0.0030	0.6222	0.0363
	(0.0570)	(0.1974)	(0.4081)	(0.1752)
Observations	108	45	47	49
Adjusted R^2	0.1405	0.6368	0.4182	0.2266

Note: Financial leverage is debts in current liabilities and long-term debts over assets; *significant at 10%; **significant at 5%; ***significant at 1%.